

# MARINE REVIEW.

VOL. XIII.

CLEVELAND, O., FEBRUARY 6, 1896.

No. 6.

## DEEP WATERWAYS.

CONDITIONS OF DIFFERENT SECTIONS OF THE 20 AND 21-FOOT CHANNEL—A DRAFT OF 17 FEET IS ASSURED IN THE LAKE MICHIGAN TRADE DURING THE COMING SEASON IF WATER IS AT NORMAL STAGE.

Although it is not expected that the deep water channel of the lakes in all its parts, including St. Mary's Falls canal, will be entirely completed until the opening of navigation in 1897, lake vessels will be afforded great advantages in using parts of this new waterway during the coming season. In some cases, whole sections of the 20 and 21-foot channel are now completed; others will be entirely finished within one to three months after the opening of the coming season, and others still will be completed as regards part of their width, so that advantage may be taken of the full draft which they will afford, although not the full width.

This is especially true of sections of the work between Lakes Huron and Erie, or in other words, the channels that will be used by vessels in the Lake Michigan trade. With a view to showing the progress of work in all of the connecting waters between Lakes Huron and Michigan, the REVIEW presents as a supplement to this issue a chart showing the present state of these improvements. The drawing was made by Mr. Edward Molitor, who has for a number of years past been engaged on work of this kind in the United States engineer office, Detroit, Mich. Permission to make this drawing was granted by Lieut. Cavanaugh, corps of engineers, U. S. A., who is in charge of the Detroit office, and the REVIEW is indebted to Lieut. Cavanaugh also for all information contained in this article. The main object in having this chart prepared is to show that shortly after the opening of navigation next season all sections of the 20 and 21-foot channel between Lakes Huron and Erie will be available to vessels drawing 20 feet of water, at normal stage, but unfortunately a great deal of dredging and rock blasting is yet to be done between Ballard's reef and Lime-Kiln crossing, Detroit river, and also in the Canadian channel between Amherstburg and the lower end of Bois Blanc island, Detroit river. These places are not covered by the big channel contracts. The work of dredging in the vicinity of Ballard's reef is dependent upon appropriations aside from those for the 20 and 21-foot channel between Chicago, Duluth and Buffalo.

### DETROIT RIVER POINTS WHERE DREDGING IS STILL REQUIRED.

At the present time a channel 600 feet wide has been cleared of obstructions to a depth of 18 feet at the normal stage of water, from Ballard's reef to Lime-Kiln crossing, the axis of the channel being the lower Grosse Isle range lights. The eastern half of this channel, 300 feet wide, is now being dredged to a depth of 20 feet, while the western half is open to the use of vessels. After the eastern half has been completed to the full depth of 20 feet, which will be done probably about the first of September, it will be thrown open to the use of vessels during the time the western half is being dredged to full depth of 20 feet. The completion of the western half to full depth of 20 feet will give a channel 600 feet wide and 20 feet deep at the normal stage of water, as proposed, but the whole improvement will not be finished before the end of the season. In the channel between Amherstburg and the lower end of Bois Blanc island there are a number of obstructions having but 17 feet of water over them at the normal stage. This part of the river was to have been improved by the Canadian government and dredges were to have been put on last season, but as yet no steps have been taken for the removal of the obstructions, and as this will soon be the only part of the deep channels where obstructions reach above 18 feet, the United States will have to take the necessary steps for the removal of these obstructions, unless the Canadian government does so, in order that full advantage of other improvements may be obtained. With the completion of the eastern half of the channel between Ballard's reef and Lime-Kiln crossing, about the middle of next season, these obstructions will become even more serious, for they will lessen, by from 2 to 3 feet, the depths otherwise available.

### SEVENTEEN FEET DRAFT FOR LAKE MICHIGAN COMMERCE.

Now as to what may be expected shortly after the opening of navigation next season: In 1895 the loss to vessels in carrying capacity on account of low water was the greatest ever known, but there were times, however, during the period of best water when vessels from Chicago and Escanaba passed through the river drawing full 16 feet. The great difficulties encountered by these vessels were met at Grosse point and

at Ballard's reef. Next season about 1800 feet at the lower end of the Grosse point section of the new channel, from the 19-foot contour in Lake St. Clair into Detroit river will, shortly after the opening of navigation, be available to traffic, giving an available depth of 19 feet through Lake St. Clair. Conditions at Ballard's reef, where there is now available a channel 300 feet wide and 18 feet deep at normal stage, (i. e. the western half of proposed channel) will remain unchanged until the eastern half is completed to the full depth of 20 feet, giving a channel 300 feet by 20 feet, about Sept. 1, 1896; but it is unfortunate that little if anything more than 17 feet may be expected in the Canadian channel between Amherstburg and the lower end of Bois Blanc island. It is reasonable to expect, however, that with any improvement at all in the waters of the lakes generally, full 17 feet draft will be afforded vessels in the Lake Michigan trade. Firms owning vessels and controlling docks at Ashtabula are accordingly preparing for 17 feet draft in the rivers, and they propose to provide a similar draft in Ashtabula harbor, where dredges were at work the greater part of last season, and will again begin operations at the earliest opportunity in the spring.

The situation is different as regards Lake Superior. For the trade through the Sault canal, there is, of course, no hope of increased draft, excepting such as may be derived from a natural increase of water levels, until the new canal is in readiness in the spring of 1897. Then, too, there is one section of the 20 and 21-foot channel in the Sault river—section 3 at Sailor's Encampment—upon which there is a great deal of dredging yet required. But it is now certain that all parts of the 20 and 21-foot channel work proper will be entirely completed during the coming season, as the condition of the work at present is as follows: Section 1, (two shoals near Round Island, above Sault Ste. Marie) is done; section 2, (Little Mud lake and Dark Hole, Sault river) is practically completed; section 3, (Sailor's Encampment, Sault river) is well along towards completion and will be finished during 1896; section 4, (head of Mud Lake, Sault river) is completed; section 5, (foot of Lake Huron) not entirely completed but eastern half, 1,200 feet wide and 21 feet deep, available for traffic; section 6, (St. Clair Flats) is completed; section 7, (Grosse point, foot of Lake St. Clair) not entirely completed but lower 18,000 feet, giving a 19-foot navigation, can now be made available for traffic and entire section will be finished shortly after the opening of navigation in 1896; section 8, (mouth of Detroit river) not entirely completed, but available for traffic and will be finished shortly after opening of navigation in 1896.

### LITTLE PREPARATION IN LAKE ERIE HARBORS.

Now while it is shown here that there is every reason to expect at least 17 feet of water at normal stage next season for vessels in the Lake Michigan trade, it may be said in a general way that there is not now a single harbor on Lake Erie that will admit vessels of that draft. Ashtabula harbor will afford such a draft shortly after the opening of navigation, but even at that point there is danger of the mouth of the harbor filling up with sand unless constant dredging is resorted to. The information contained in this article tends to show, however, that the deep-water channels are gradually approaching a reality, and municipalities, dock corporations and other interests will certainly make short work of fitting the harbors of Lake Erie for 18 or 20 feet draft, if the work in connecting rivers of the lakes turns out to be all or nearly all that is expected of it. One other point must be borne in mind by vessel owners. If expectations regarding this deep draft are realized, there are a great many steel vessels now in commission that must be strengthened and otherwise prepared for it.

President J. J. H. Brown of the Lake Carriers' Association adds the following note to a communication of recent date: "Some one has been kind enough to mail me a copy of the Detroit Evening News of Jan. 31, containing a striking illustration of a bridge, which is dedicated to the 'Hog Carriers' Association.' The name is new to me, but as I take it, it is suggestive of a railroad combination, which admiring the success of the Lake Carriers' Association, has come as near imitating the name as they could without infringing on our patent. It is an old saying that 'imitation is the sincerest flattery.' I think the design most perfectly illustrates the position of the Michigan Central Railroad Co. on the Detroit river bridge question, in its efforts to needlessly obstruct the free and safe navigation of the river."

SUBSCRIBERS WILL AVOID DANGER OF MISTAKES BY GIVING THE OLD AS WELL AS THE NEW ADDRESS WHEN A CHANGE IS DESIRED.



### Another View of the Lake Level Question.

Editor MARINE REVIEW: Among thinking, practical people, including civil engineers, there has been a belief that nothing could be done by any contrivance of man, that would sap the resources of the great lakes to their detriment. One trifling loss might be overlooked, but when you add several trifles together there is gradually a realizing sense that something is going wrong with the levels of our inland seas. It can not be laid to mere annual or longer period changes. The lowest plane is a serious matter even today, and it should be stopped at once.

There appeared in the Chicago Tribune of Jan. 20, an editorial entitled "To Raise Lake Levels," which referred to the Lake Carriers' Association meeting held at Detroit recently. A statement made by the board of managers at that meeting about the high water of 1886 and the low water now prevailing, affirmed that there was a difference of "at least 3 feet." There can be no doubt Lake Erie is a great sufferer from a diminished water supply from the lakes above, as well, to some extent, from the water-shed on her own borders; and that there is at present a lower average plane than ever before existed, which is somewhat in excess of the one on Lakes Huron and Michigan.

"To restore Lake Levels" was the heading of another editorial in the same paper on Jan. 28. Restoration of old time lake levels is a work of the future. In the meantime let us preserve the present lake levels. Some days ago I read in the Tribune a communication from Mr. S. A. Thompson, in which he discussed the "Levels of the Lakes." After reading the above editorials, I again looked over Mr. Thompson's communication and I send you the following:

"It seems evident the level of the lakes will be a very live subject in congress this winter," says Mr. Thompson. In another paragraph he directs attention to a statement of Senator Brice, in which he says: "The present low level of the lakes constitutes a serious menace to lake navigation." And again that Messrs. Whiting of St. Clair and Weadock of Saginaw, when they represented congressional districts of Michigan, opposed "a 20-foot channel." They claimed the St. Clair Flats constituted "a natural dam." In support of this claim it was pointed out that the water was lower in 1891 (Huron and Michigan) than it had been for a generation." The Michigan parties claimed that this condition was brought about "solely" by the construction of the St. Clair Flats ship-canal in 1873. If the St. Clair Flats channel was made deep and large enough to reduce the depth of Lakes Huron and Michigan several feet, the claim was well founded that a similar channel of greatly increased dimensions would be disastrous. The opponents were in error by assuming that a great fluctuation represented a permanent reduction of level, when they should have stated that it was the beginning, or a contributor, to a loss of level. For time has unmistakably proved that it has been one of the causes which has brought about a part of the present permanent reduction of the level of Huron and Michigan.

"The argument used by the gentlemen was plausible in appearance as it was fallacious in fact," says Mr. Thompson. The range of periodic fluctuations stated by the writer are from 5 to 6 feet. These periodic fluctuations are governed by natural laws and have no connection with the artificial practices which have already created a measurable menace and from present indications are likely to be increased to such an extent that the menace will soon reach formidable proportions from which it will prove difficult, if not wholly impossible, to recover.

"At the request of Chairman Blanchard," says Mr. Thompson, "I made an examination of the official records of lake levels. The facts I found proved, beyond question, that those claims had no foundation whatever. Indeed the facts made the claims absurd and ridiculous by showing that if the St. Clair Flats canal had affected the lake levels at all it had affected them favorably instead of unfavorably." A specious and beguiling use of the uncontrollable upward periodic movement of the surfaces of Huron and Michigan. To use a downward movement to prove that the deepening of the channel to 20 feet of the same area, but of more depth than before, would at once ruin all the harbors was just as wrong. Both conditions are outside and inside of the real trouble. The rise and fall of the great lakes during the past few years fall short of the high level and go below the low level of former years before the channel improvements and other artificial causes began to operate. In the following paragraphs I quote other sentences from Mr. Thompson's communication and append notes regarding them:

"As soon as work commenced on the canal (through the St. Clair Flats) the water began to rise and strangely enough continued to rise until the canal was finished. But in the following year there was one of the most remarkable drops on record." "All the cranks," who had insisted that the 20-foot canal through the St. Clair Flats would drain the upper lakes, watched with amazement the "five years steady rise" of the water while the canal was under way, now cried, (thoughtlessly), "we told you so." The menace-to-navigation-cranks were unduly hasty in claiming this remarkable drop to be a convincing proof in their favor. It was no more so than a rise was proof that no loss of permanent level had occurred by reason of past improvements and other causes. Again

the rise and drop were periodic fluctuation movements not reaching the high average and going below the low average.

"The cranks failed to see how ridiculous they made themselves by failing to take note of the behavior of Lake Erie." Lake Erie, as stated, is one-fifth the area of Huron and Michigan and should have gained after a 2-foot loss above, 10 feet in depth. "Even with the rapids and Niagara Falls as an outlet this smaller lake should have shown a large rise. But Lake Erie was also low in 1872." Lake Erie would have broken the law of supply and demand if it had not been lower after this most remarkable drop of Huron and Michigan. This drop can not be attributed to any very slight increase of flow, by reason of improved channels, for, if so, the loss of head would very soon have decreased largely the amount of water flowing through the St. Clair river. To account for this drop, to carry off water enough to raise Lake Erie, almost another St. Clair river would be needed.

A loss of depth above makes a loss outflow through St. Clair river into Lake Erie and thence to Niagara river, the rapids and the falls. The rapids and falls have a current which for capacity for carrying off water would not diminish in the same proportion as would the slower current above. Therefore Lake Erie would lose more in proportion in depth than Huron and Michigan. Suppose at the opening of the drainage channel there should be a low stage of water, and the water from Michigan and Huron should commence flowing to the Illinois river, and from this low stage the water should begin to rise, it would be no answer that a lower average plane did not exist. If the water should be high when the drainage channel was finished and, after water should commence flowing to the Illinois river, the lakes should commence falling, it would be no proof that this increased flow was drawing off the water. It undoubtedly would be by inches, but not by feet. If this were by feet Lakes Michigan and Huron would be ruined for navigation in a year or less. It is the little losses that should be watched that have already made a permanent lower plane between the two extremes of high and low water.

"The levels of the lakes went up and down before the channels were deepened just as they have done before the improvement of the channels was begun"—and they will continue to go up and down no matter where the plane may finally be established. "It seems to me, (Mr. Thompson), "the facts which have been set forth prove conclusively that the deepening of the channels has worked no harm to the lakes themselves or to the harbors situated thereon, and hence there is no foundation for a fear that similar improvements, now planned or under way, will work harm in the future." An alluring statement, based on the uncontrollable laws of nature having nothing to do with unnatural sapping of the water supply resources which have in all past time preserved the average lake levels. Some time ago I was astonished to hear from a party whose motive and sense of honor could not be questioned, that if the sources of supply of Huron and Michigan were entirely shut off, and the outlet through St. Clair river left open, it would be years before the level above would be unfavorably affected. On the contrary, this would in one year, or even less, ruin all the harbors on Huron and Michigan.

"Engineers who have studied the subject carefully feel confident that regulating works, will not only confine the periodic fluctuations of levels within a range of one or two feet, instead of five or six, as at present, but will maintain the lakes at a permanent higher level." How can the periodic fluctuations be kept within a less range than at present, on the same or perhaps a greater area and depth than before? The laws governing the natural movements up and down the immense lake surfaces are beyond human control (as Mr. Thompson correctly says) and cannot be repaired so that the great surface movements may be controlled. Cutting off the forests and cultivation of the lands are causes which have helped to make permanent present diminished lake levels. To prevent future losses from this source, and a reasonable restoration of lake levels, as nearly as possible, is a government affair, and should at once be looked after. This would be a much better and more practical way than building dams. There is a territory on the American water-shed, bordering the lakes, where restoration can be made effective. The dominion government could, on the northerly shores of Georgian bay and Lake Superior, could do much more for renewing and increasing the water supply than can other territory near the shores of the great lakes. From now on allow no diminishing of forests areas on land of little value for cultivation. Keep it good and gradually add territory. Shut the barn door and keep all the horses that are now left. Keep intact the water supply. This will help, if the present leaks are not increased. All this would certainly be in the line of preventing losses and do more good, at a cost within reach, than would the plan for making dams or other ways for re-establishing or increasing lake levels.

GORDON H. NOTT,

No. 834 Rookery, Chicago, Ill., Feb. 2, 1896.

Thos. Drien & Son, Wilmington, Del., write that they will return to their rebuilt factory in a week or two. They are rushing lake orders for metallic boats and will have them ready for shipment soon.



### A Big Passenger Ship.

A vessel launched at Newport News, Va., on Thursday last will rank with the best passenger ships of this country. Her name is Grand Duchess and she was built by the Newport News Ship Building & Dry Dock Co. for the Plant Investment Co., which operates an extensive system of steamships lines, railways and hotels around the Florida coast and between Port Tampa and Cuba. The new ship will run between Port Tampa and the Bahamas. She is exceeded in size in this country only by the American liners St. Louis and St. Paul, and is remarkable also for the fact that she is fitted with quadruple expansion engines and water tube boilers of the Babcock & Wilcox type.

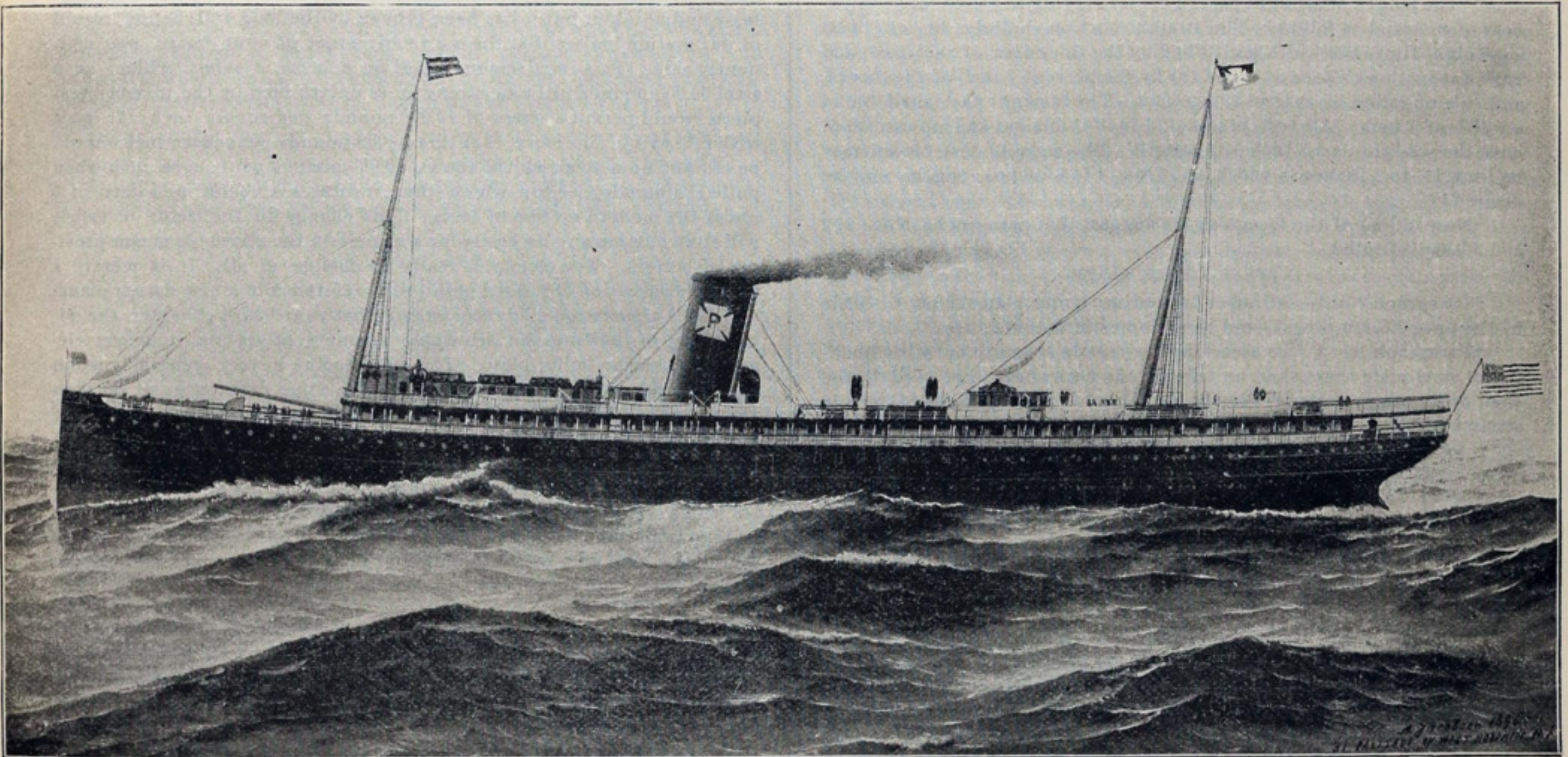
This vessel will have accommodations for about 300 first-class and 400 second-class passengers. She is entirely of steel and is 404 feet over all, 380 feet between perpendiculars, 47 feet 9 inches beam and 37 feet 4 inches deep from top of deck to base line. Two steel masts are fore and aft rigged. Stern and rudder frame are of cast steel and the rudder stock is of the best fluid compressed steel, made by the Bethlehem Iron Works. The equipment includes a Providence steam windlass and capstans and cargo hoisting engines made by Williamson Bros. of Philadelphia.

The machinery will consist of two inverted direct acting quadruple expansion engines, driving twin screws, which are to be of the best

organization. One important act was the appointment of an advisory board, which is to act with the president, and which is made up of Past-National-President Geo. P. Wilson of No. 13, Philadelphia, Wm. F. Yates of No. 33, New York, and Wm. Sheffer of No. 5, Baltimore. Hereafter all associations on the lakes will elect officers at the first regular meeting in January. This makes the time for elections a little later than it has been in the past, in order that engineers who are late in laying up their vessels after the close of navigation may all have a voice in selecting officers. Representative Henry of No. 92, Saginaw, Mich., introduced at the convention a resolution providing that all applicants for engineers' licenses shall be signed by three engineers, who must be in actual practice at the time of signing such application. The resolution was not made a part of the bill now before congress, but it will probably be considered by executive officers of the organization. It has been proposed to amend the engineers' bill in some respects, and there was read at the convention a communication from Chief Engineer Doran of the International Navigation Co. proposing certain amendments in the measure, but the engineers absolutely refused to amend it in any way.

### New Vessels in Coast Yards.

J. H. Dialogue & Sons, Camden, N. J., have just launched a large tug for the United States government, which will be used in New York



STEAMER GRAND DUCHESS—NEW PASSENGER SHIP BUILT AT NEWPORT NEWS FOR THE PLANT SYSTEM.

manganese bronze. It is expected that the engines will develop about 7,000 horse power. The number of water tube boilers is eight, built for a working pressure of 250 pounds. The ship will be fitted with a complete outfit of Blake pumps, including independent air pumps for the main condensers. The air pumps are of the Blake verticle twin type, the same as are used on the cruisers built by the Cramps. We are indebted to the Marine Journal of New York for the engraving of the Grand Duchess, which appears on this page.

### Marine Engineers.

It is probably not generally known that the first six local associations of the Marine Engineers' Beneficial Association, which met in annual session in Washington last week, were organized about twenty-one years ago in Buffalo, Cleveland, Detroit, Chicago, Baltimore and St. Louis. Membership of the organization now is about 3,000. There is said to be 17,000 marine engineers in the United States, including those in the navy. It is understood that as a result of discussion of affairs of the association on the lakes, President Geo. Uhler will spend about three months of his time during the coming year on the lakes. Such parts of the proceedings of the Washington meeting as have been published show that most attention was given to the bill now before congress providing, mainly, that engineers shall all be officers of steam vessels and that they must in all cases be American citizens. No change was made in officers of the

harbor. The vessel is of steel, 105 feet over all, 20 feet beam and 10 feet depth, and will have an iron trunk cabin, containing large pilot house and rooms for captain and engineer forward of the engines, as well as a spacious saloon fitted in mahogany aft of the engines. The boat will have high speed compound engines, with all pumps independent, and water tube boilers of large grate surface furnishing steam at 150 pounds pressure. An electric light plant and a steam steerer are other modern features of equipment in the vessel.

Neafie & Levy of Philadelphia have contracted to build for the Mexican government a steel light-house tender that is to be 130 feet long, 25 feet beam and 11 feet depth. The vessel will have triple expansion engines. The steamer Charter Oak, which this company is building for the Hartford & New York Transportation Co., was launched Saturday. Another vessel building at this yard is the Deina de los Angeles, a steamer that is intended for Cuban trade. All these ships are being built under the rules of the United States Standard Register of Shipping, New York.

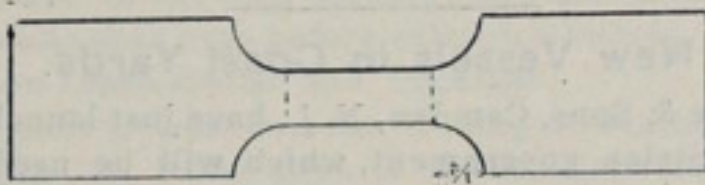
At the annual meeting of the Maine Steamship Co., to be held at Portland on the 5th inst., a contract will be awarded to build, for the New York and Portland line, a new iron steamship of 3,500 gross tons, with a speed of 18 knots, and which is expected to make the trip between her terminal points in twenty-one hours, or five hours less than is required of the steamers now used by that line. The ship is to be completed for the season of 1897.



### Marine Boiler Steel.

It will probably be a week or ten days before an official account will be published of the meeting of the United States supervising inspectors of steam vessels, held in Washington recently. In the meantime manufacturers of boiler plate, inspectors and others will be interested in the suggestions made to the board by the Association of American Steel Manufacturers regarding changes in specifications for boiler steel. The circular which the steel manufacturers addressed to the board is as follows:

"Referring to the general rules and regulations prescribed by the board of supervising inspectors of steam vessels, as amended January and February, 1895, the Association of American Steel Manufacturers would suggest that that part of section 3, on page 14, reading as follows, be stricken out: 'To ascertain the tensile strength and other qualities of steel plate there shall be taken from each sheet to be used in shell or other parts of boiler which are subject to tensile strain a test piece prepared in form according to the following diagram:



"The length of straight part in center varying as called for by thickness of material as follows: The straight portion shall be in length at least eight times the width multiplied by the thickness of said part, and have a reduction of area as called for by the present rules of the board, and an elongation of at least 25 per cent. The straight part shall be of a width of 1 inch. All test pieces of 1 inch thickness and upward shall have the straight part 8 inches in length. The ends of test pieces may be from 1½ to 2 inches in width, and from 4 to 6 inches long, as may be desired."

"Now in lieu of the foregoing we suggest that paragraphs Nos. 1, 2 and 3 be substituted.

#### STEEL BOILER PLATE.

"Paragraph No. 1. All steel for marine boiler plates must be made by the open-hearth process and be of domestic manufacture.

"Paragraph No. 2. To ascertain the tensile strength or other qualities of steel plate there shall be taken from each sheet to be used in the shell or in other parts of the boiler which are subject to tensile strain a test piece prepared in form according to Fig. 1.

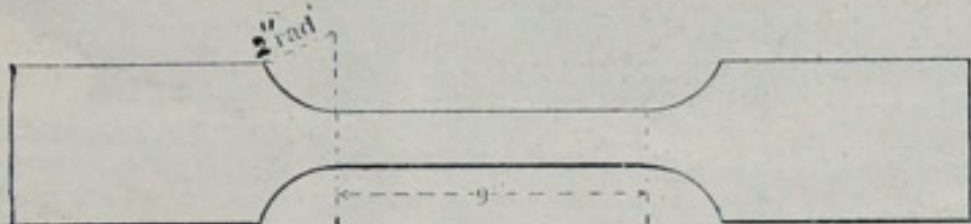


Fig. 1.

"Paragraph No. 3. The elongation for all thicknesses shall be at least 25 per cent. and the reduction of area shall be the same as called for by the present rules of the board. The width in all cases shall be 1 inch. The ends of the test piece may be from 1½ inches to 2 inches in width, and from 4 to 6 inches long, as may be desired. Before placing the test piece in the machine, punch marks shall be placed at intervals of 1 inch. The length in which the elongation is measured shall be taken as nearly equally as possible on both sides of the fracture. In plates less than ¼ inch in thickness this length shall be 2 inches. In plates ¼ inch thick and up to ⅜ inch it shall be 4 inches. In plates from ⅜ inch to 1 inch inclusive it shall be 8 inches. In plates over 1 inch it shall be 6 inches. It is also suggested that additional requirements be incorporated in the specifications as embodied in paragraph No. 4.

"Paragraph No. 4. The maximum figure which can be stamped upon the steel as indicating its tensile strength shall be 60,000 pounds per square inch and the factor of safety in all cases shall be five.

"This association would also recommend that your board place a limit upon the allowable content of phosphorus and sulphur in boiler plate. Paragraph No. 4 is of pre-eminent importance, and it is necessary to explain its bearing and force. Under the present law there is nothing to prevent a boiler maker from ordering steel with a tensile strength of 70,000 pounds, or even 80,000 pounds, per square inch, and using a proportionately high steam pressure. The cost of such steel to the manufacturer is no greater than a softer metal, so that a protest against it does not arise from any mercenary motives, but it is the unanimous opinion of the members of the Association of American Steel Manufacturers that not only is such an increase in steam power unwarranted and dangerous, but that such hard steel is unfit for steam boilers, no matter what the pressure may be. The temptation to order such material will be removed if no increase in steam pressure is allowed for an increase in tensile strength above 60,000 pounds per square inch. The placing of the factor of safety at five instead of six, as at present, may seem to be a

sacrifice of safety to expediency. That such is not the case will be seen from a consideration of the following facts: The practice of the board in regard to the allowable limits of steam pressure is founded on the results deduced from the old system of grooved test, such as is shown in Fig. 2.

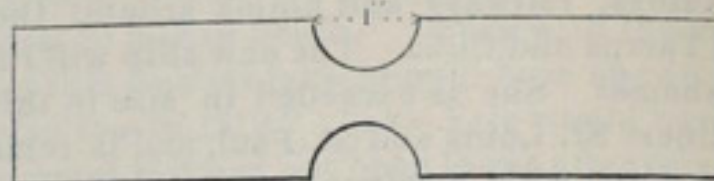


Fig. 2.

"It has been an accepted fact for many years that such a test gives a tensile strength about 10,000 pounds per square inch above that which would be obtained from a parallel sided test piece, such as is shown in Fig. 1. In other words, if the grooved test piece gave an ultimate strength of 60,000 pounds per square inch, then the real strength of the piece would be about 50,000 pounds per square inch, when tested in a strip with parallel sides, this being now the universal and accepted method throughout the engineering world. Granting these premises, it follows without argument that the stress per unit of section, which is allowable for a 60,000 pound steel when tested in a grooved section, is allowable for a 50,000 pound steel when tested in a parallel section. The allowable stress per unit of section is to some extent a matter of estimate and opinion, but it has been proven by the long and happy record of our marine boilers that the old requirement of your board was eminently safe. This requirement called for a factor of safety which, on a steel 60,000 pounds ultimate strength, as determined by the grooved test piece, would permit a stress of 10,000 pounds per square inch. It goes without saying, therefore, that this 10,000 pounds per square inch should be allowed on a steel which shows 50,000 pounds per square inch when pulled in parallel section, which thus indicates a factor of safety of 5 under the modern system of tests. This change in the factor of safety will thus obviate any necessity for a change in the allowable steam pressure of boilers. The change is really no change at all. It is merely a new determination of a fixed point with reference to a new datum plane.

"This association also recommends that your board consider the advisability of limiting the allowable amounts of certain injurious elements in marine boiler plate. This has become a very general custom in structural engineering. There may be some differences of opinion among metallurgists as to the exact effect of certain elements upon the properties of steel, but there is perfect unanimity in regard to the injurious effect of phosphorus and sulphur. Under the present rules of the board it is perfectly possible for a manufacturer to use a metal for boilers which would not be accepted by the majority of engineers for the most unimportant work, and it is absolutely certain that such a clause would be a long step in the direction of a much better and safer metal, while it would not materially enhance the cost."

### Around the Lakes.

The new Union line steamer that is being built by the Union Dry Dock Co. of Buffalo will be a complete steel vessel. Only the inside finish of cabins will be of wood.

The Jenk Ship Building Co., Port Huron, Mich., is building a new hull for the machinery of the tug Sumner. The new boat will be owned by the H. M. Loud & Sons Lumber Co., Oscoda.

C. R. Jones and others of Cleveland have purchased the schooner Charles Wall from the estate of Richard Winslow, through Geo. R. Teller, attorney, of Buffalo. The vessel is now undergoing repairs at Tonawanda.

One of the most forcible letters, from the vessel owners' standpoint, written to the commerce committee of the senate on the Detroit river bridge question, was that of Jesse H. Farwell, the well-known Detroit contractor.

Osborne, Seager & Co., coal miners and coal dealers, will have in operation in Cleveland next season a coal dock of the pocket kind, similar to those at Detour and on the Detroit river. The dock will be located just above the Superior street viaduct.

Johnston Bros. of Ferrysburg Michigan have been building up of late quite an extensive business in the marine line. A late order is for a fire-box boiler, 8½ feet in diameter and 16 feet long, to carry 150 pounds working pressure, for the Chicago tug T. T. Morford.

The \$940,000 judgment of Alfred Merritt of Duluth against John D. Rockefeller, resulting from the big Mesabi mining and railway deal, is now under review by the United States circuit court of appeals sitting at Duluth. Court costs and interests have already increased the amount involved to more than \$1,000,000. A decision is awaited with great interest in Minnesota, as it is said that suits aggregating about \$4,000,000 will be brought against Mr. Rockefeller if this one goes against him.



### Commerce of Duluth and Superior.

At last some statistics that may be regarded as reliable are at hand regarding the commerce of Duluth and Superior, the two principal ports at the head of Lake Superior. In accordance with a law which provides that engineer officers in charge of river and harbor improvements may require vessels to furnish reports of cargoes passing through channels in which improvements are under way, Major Clinton B. Sears of Duluth secured during the season of 1895 reports from all vessels passing in and out of the harbors of Duluth and Superior. He has prepared elaborate tables giving the results of this labor. Coal dealers will be especially interested in the figures, as they show receipts of both anthracite and bituminous coal at the two ports. Following are some extracts from the report:

#### CONDENSED STATEMENT OF LAKE COMMERCE AT DULUTH AND SUPERIOR SEASON OF 1895.

Number of vessels arriving,	5,436;	registered tonnage,	5,576,804
" " departing,	5,380;	" " "	5,629,678
Total arrivals and depart's,	10,816;	" " "	11,206,482
Receipts, net tons,	2,035,465;	valuation,	\$27,443,512.
Shipments, " "	4,375,886;	" " "	68,564,240
Total, " "	6,411,351;	" " "	\$96,007,752

Of the total receipts and shipments Duluth is credited with 3,748,070 net tons, valued at \$47,695,860, and Superior is credited with 2,663,281 net tons, valued at \$48,311,892. Although not leading in tonnage, Superior is considerably ahead of Duluth in receipts of coal and shipments of flour and grain, which are the principal items of freight. Receipts and shipments of these commodities are shown in the following tables:

#### RECEIPTS OF COAL AT DULUTH AND SUPERIOR, SEASON OF 1895.

	Duluth.	Superior.	Total.
Anthracite coal, net tons.....	245,675	482,934	728,609
Bituminous coal, net tons.....	336,007	633,115	969,122

#### SHIPMENTS OF GRAIN AND FLOUR FROM DULUTH AND SUPERIOR, SEASON OF 1895.

	Duluth.	Superior.	Total.
Flour, barrels.....	4,070,033	5,029,544	9,099,517
Wheat, bushels.....	15,856,265	20,560,929	36,417,194
Other grain, bushels.....	2,502,229	3,274,417	5,776,646

Entries and departures of vessels at Duluth aggregated 7,398 vessels of 7,163,490 registered tons; at Superior, 3,418 vessels of 4,042,992 registered tons.

### Lake Freight Matters.

Pig iron is a little lower at this writing than it was a week ago, but a slight difference in price just now is not important, as there is not a great deal doing in sales. From the manner in which ore dealers have left Cleveland on vacations, some of them to be gone a month or more, it is evident that they have made their minds up to a determined stand on the agreement which has been formulated between them and which is now complete in all its details. A fairly strong feeling still prevails among vessel owners, as indicated by conditions attending such grain as is offered at Duluth for shipment in the spring. One of the leading brokerage firms at Duluth writes as follows under date of Feb. 5:

"The grain market is quiet. Shippers are bidding 3 cents for tonnage to arrive on the opening, and vessels are asking 3¼ cents. We think that were the owners of tonnage to make any concessions, business could be done on a basis of 3½ cents. So far as our experience goes there seems to be rather a strong feeling among the owners of boats. The quantity of grain in store at Duluth exceeds that in store here a year ago by 1,000,000 bushels. This, however, affords but little insight into the real facts of the case, for there is much more grain to go forward from now on than characterized the situation during the early months of last year. We are thoroughly convinced that there is plenty of wheat in the country, and it is more than probable that the higher range of prices, which now prevails, will bring it forward in large quantities. The movement of coal from Duluth and Superior during November and December was the largest ever known for these months. The mild weather prevailing through January has, of course, had a marked effect on the coal trade, but from the best information we are able to obtain, more coal has been sold up to the present time than during the winters of 1894 and 1895. The coal people are not all of the same mind as to the probable surplus at the opening of navigation. The opinion seems to be general, however, there will be very little coal left on the docks when the first vessel arrives here."

Some uneasiness has been felt in the Pittsburg coal mining region during the past week on account of the New York & Cleveland Gas Coal Co., a large concern, announcing its intention to break away from the agreement regarding mining wages, which were fixed up some time ago. It is not thought, however, that the action of this company will result this year in disturbing the coal mining business to the extent that it has during the past two years of depression.

### Appointments of Masters and Engineers.

Buckeye Steamship Co., Cleveland: Steamer—City of Glasgow, Capt. John McNeff, Engineer C. R. Price.

Hawgood, W. A. Cleveland. Steamers—L. R. Doty, Capt. Chris. Smith, Engineer Thomas Abernathy; Iosco, Capt. David Hutchinson, Engineer Thomas Welsh; Schooner—Olive Jeanette, Capt. David Cadotte.

North Shore Navigation Co., Owen Sound, Ont.: Steamers—City of Coilingwood, Capt. W. J. Bassett; City of Midland, Capt. F. L. La France; City of Parry Sound, Capt. G. W. Playter; City of London, Capt. E. Walton; City of Toronto, Capt. A. C. Cameron.

A mistake was made in saying that Capt. A. H. Reed, who was in the steamer Nimick, would sail next season the steamer Queen City, which is being built by the Cleveland Ship Building Co., and of which A. B. Wolvin of Duluth is managing owner. The Queen City will be sailed by Capt. Ralph Lyons, who was in the Zenith City last season, and the Zenith City will be sailed by Capt. Robert Cowley, who was in the employ of W. C. Richardson of Cleveland. An error was also made by Capt. John W. Moore in including Capt. John Coulter in his list of appointments as master of the steamer Louisiana. Capt. Coulter will sail the steamer Yale as he did last season and Capt. Truman Moore again takes the Louisiana.

### A Quarter-Century of Ship Chandlery Business.

On February 1, 1871, Messrs. J. E. Upson and J. W. Walton, two young men, formed a partnership and went into the ship chandlery business in Cleveland. The business of V. Swain, who conducted a ship supply business in Cleveland in 1850, and L. L. Lyon, who was engaged in a similar business from 1859, was merged into the new concern not long after its organization. An evidence of the growth of the firm and the volume of business transacted during the past twenty-five years is found in the amount of wire rope handled. In 1871 the company bought 1,000 feet of wire rope, the first ever brought to the lakes for rigging purposes. Wire rope was not in demand and it is possible that the young ship chandlers thought it was not even suitable for suicidal purposes if its purchase resulted in stranding them. But it was sold eventually, and since that time the company has imported 501 lots of wire rope, the total length being 8,544,241 feet, or over 1,600 miles, which would cover the sailing courses on the lakes from Buffalo to Duluth and from Mackinaw to Chicago and return.

The twenty-fifth birthday of this concern was celebrated by a dinner at the Weddel House, Monday evening, at which the principals and employees of the company were present. The menu was interesting. One of the big cordage houses was remembered by Sewall-Day brown bread. Corn beef hash a la Warrington and Upson-Walton salad were other features of the bill.

Mr. John Gordon of Buffalo has been actively engaged for some time past on a proposed new line of package freight steamers to run between Buffalo and the head of Lake Superior, and it is now quite probable that he will be successful in his efforts, although no details have been given out regarding railway connections at either end of the route. He has been negotiating with the owners of the Menominee line of steel steamers controlled by M. A. Hanna & Co. and the Globe Iron Works Co., Cleveland. Any or all of these vessels—there are five of them—could be readily fitted up with gangways and freight-handling apparatus for the package freight trade.

Capt. Daniel McLeod has fixed Feb. 17 as the date for the first meeting in Cleveland of representatives of the different lake underwriters, who will be associated with him in changing ratings, valuations, etc., in the Inland Lloyd's Register for 1896. There will be no general examination of vessels. This board, in which it is expected all of the general agencies will be represented, will make changes in accordance with information which the underwriters have in hand, or which they may yet secure from owners and others, regarding the condition of the different vessels.

A dividend of \$3 a share was paid, Monday, to stockholders of the Chandler Iron Co., from earnings during 1895. Last year this company paid \$1.75 a share but had not paid anything to stockholders for two or three years previous. The Chandler has a surplus of about \$1,200,000. The annual meeting of the Cleveland-Cliffs company was held a few days ago. The company made some money during the year but no dividend was declared.

Cassiers' Magazine for February contains an illustrated article on "Modern Ship Building Tools" by J. Arthur Gray, a well known English engineer, and also a well-written biographical sketch of John I. Thornycroft, the famous English builder of high-speed war vessels, by C. J. Cormish.

The insurance and vessel brokerage firms of Chicago and Buffalo known as Palmer, Cook & Calbick and Calbick, Palmer & Bone have both dissolved.





DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O

SUBSCRIPTION—\$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department on June 30, 1895, contained the names of 3,342 vessels, of 1,241,459.14 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons, and over that amount, on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1895, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels.....	1,755	857,735.00
Sailing vessels.....	1,100	300,642.00
Unrigged.....	487	83,082.00
Total.....	3,342	1,241,459.00

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

Year ending June 30,	Number.	Net Tonnage.
1891.....	204	111,856.45
" " " 1892.....	169	45,168.98
" " " 1893.....	175	99,271.24
" " " 1894.....	106	41,984.61
" " " 1895.....	93	36,353.00
Total.....	747	334,634.28

#### ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

(From Official Reports of Canal Officers.)

	St. Mary's Falls Canal.			Suez Canal		
	1894.	1893.	1892.	1894.	1893.	1892.
No. vessel pass'ges	14,491	12,008	12,580	3,352	3,341	3,559
T'n'ge, net registd	13,110,366	9,849,754	10,647,203	8,039,106	7,659,068	7,712,028
Days of Navigat'n	234	219	223	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

IF CONGRESS should decide to pass Representative Payne's bill pertaining to another meeting of the United States delegates to the International Marine Conference, there need be no fear of any interference with navigation laws on the lakes. It is now settled that the conference regulations relate entirely to the high seas. The main object in reconvening the delegates is to present to them any changes that may be proposed by other nations, especially Germany and Great Britain, in the rules of the road adopted by the conference of 1889, so that these changes may be accepted or rejected by the American delegates before they are presented to congress. It is proposed also to have the American delegates consider and report upon measures to bring inland and harbor rules in the United States into closer accord with the international rules, when the form of the latter becomes finally determined, but as all interests here are satisfied with the White law of last year, a request to exempt the lakes from any new regulations provided for the coasting service or for coast harbors will undoubtedly be granted.

SENATOR BRICE has presented to congress, in a preliminary report just submitted through the committee on commerce, a general resume of the vast amount of information which he has been collecting on the subject of regulating lake levels by means of dams. There is no need of reproducing this committee report, as the greater part of the data which it contains has already appeared in the columns of the REVIEW, and the report, which has reference particularly to senate bill No. 1339 and senate resolutions Nos. 45 and 37, may be obtained from any senator or representative. It is sufficient to say that the committee unanimously recommends the passage of Senator Brice's bill and resolutions, which provide for an investigation of the subject by the army corps of engineers and by the Deep Waterways Commission, recently appointed by the president. An appropriation of \$10,000 is provided to enable the Deep Waterways Commission to carry out this work. It is more than probable that the appropriation will be secured, as Senator Brice is deeply interested in this subject and will give the matter personal attention.

IT IS A fact that some vessels which were not tied down to contracts last season made on the high freights that prevailed as high as 20 per cent., and even more than that figure, counting out taxes, insurance, and

everything excepting depreciation. And this is based, too, on high values, such as the insurance ratings. But earnings of this kind come only in seasons that are specially profitable. The smaller class of steel vessels and such of the larger wooden boats as were tied down to contracts for the full season, or nearly so, are said to have made generally 10 to 15 per cent. Even under the low contracts, the earnings of the big steel vessels were very profitable, but these are not given out. It is probable that the steamers Fedora, Nyanza and Uganda, valued on an average at about \$100,000, and controlled by James McBrier of Erie, Pa., made a showing equal to the best of the large wooden ships. They were operated throughout the season without a contract of any kind, and \$60,000 would probably not be too high as an estimate of their combined net earnings.

THE MERITS of a newspaper, trade journal or regular publication of any kind may best be judged by the interest which subscribers show in the reading matter that it contains. Communications from subscribers on current topics, with signatures attached, (not of the "careful reader" and "subscriber" kind.) are the best evidence of this interest in any publication. The REVIEW is forced to make room for a couple of pages of communications this week and space for other news is accordingly more limited than usual.

#### Regulation of Sault River Traffic.

EDITOR MARINE REVIEW: The matter of some kind of government regulation regarding the passage of steamers through the "Soo" river in order to facilitate commerce and render less hazardous this dangerous portion of lake navigation, is indeed an important measure and one which demands much careful consideration, in order that the best and most impartial regulation possible may be devised. It has been well suggested that an officer be appointed and stationed at the "Soo" with authority to regulate the departure down the river, each morning, of all boats tying up below the lock during the night, and that perhaps the faster boats should have the preference. This method, I think, would lead to endless argument, as to which were the faster boats, as well as to criticism regarding discrimination in favor of one class of steamers and against another class, the "constitutionality" of which, or the justice of which, at least, would be doubtful. I believe, however, that a rule which I suggest here would be more satisfactory and entirely impartial, as well as facilitating departures at times when a large number of vessels are lying abreast of each other at the dock below the canal, awaiting daylight. The last ships passing through the lock during the darkness and tying up before time for departure should have the preference in leaving, and so on until all have departed, thus avoiding dangerous entanglements and delays incurred by starting inside steamers first and thus detaching the whole fleet from the docks and getting into uncontrollable confusion with consequent damage and delay. While the faster steamers might suffer slight hindrance in following slower ones, the delay could not be very serious, since the distance from the canal to wide water has been so materially shortened by the opening of Hay Lake channel and the further fact that no steamer is safe in running at anywhere near her full rate of speed through the river. Now the vessel master tying up below the lock just before darkness set in might claim that he should be the first to leave with his ship in the morning, but a method based upon this claim would be impracticable, as the entanglement already referred to would result from such a practice. The method here suggested would at least be impartial, as a vessel gaining a point on one trip through arriving at the lock late at night might lose as much on another trip when she would be among the first to tie up for the night. Everybody interested in any way in lake commerce should feel at liberty to express his views on this subject, and out of the discussion we may develop a set of rules conducive to the safety and best interests of all concerned.

JAMES STONE.

Cleveland, Feb. 3, 1896.

The United States Standard Register of Shipping, New York, will class, and Mr. Sinclair Stuart will superintend the construction of, the Minnesota Co's. steamer and tow barge building at Chicago, and also the steamer to be built for Mr. John D. Rockefeller by the Cleveland Ship Building Co., as well as the two steamers that are being built in Detroit for Mr. Rockefeller. These vessels are all on the "channel system." The two Rockefeller tow barges at Chicago are to be classed by the Bureau Veritas. In addition to the foregoing, the United States Standard Register will class the steamer Queen City, which is being built in Cleveland for A. B. Wolvin and others, together with the Wolverine company's big steamer at Detroit, and the three steel tow barges that are being finished up at Chicago.

Good magazines are now almost as numerous in this country as live daily newspapers. The busy man can not read all of them. His requirements are best served by the Review of Reviews, which seems to grow better with every issue.



## The Bridge.

Editor MARINE REVIEW: The vessel men will oppose the bridge. Of course they will. Why not? Bridging Detroit river is the most serious obstruction that has ever threatened the navigation of the great lakes. The railroad people, in their claim that the rapidly increasing traffic of their roads demands better facilities for crossing Detroit river, and in their persistence in the invasion of the rights of others, overlook and condemn the fact that the still more rapidly increasing commerce on the lakes demands clear channels in the connecting rivers. The relative merits of these two interests have been carefully discussed for years, and to the unbiased judgment it must seem a very contradiction in economics for the government to appropriate millions of dollars yearly for the improvement of the harbors and channels around the lakes, and at the same time allow Detroit river to be obstructed by a bridge. Suppose that by some convulsion of nature or other cause, an obstruction of as serious character, such as a pier of the proposed bridge, be thrown up in the river at the point where a pier may be placed. Would this obstruction not receive the immediate attention of the government? And would not all the energy of the government and every device that could possibly be employed upon it be immediately concentrated to hasten its removal? Well, then, would such an obstruction placed in the river by a railroad company be any less serious? And is it not just as necessary to prevent such an obstruction being built as it would be to remove a natural one? Suppose we grant the statement of the bridge men that a pier in the river would be no more of an obstruction in the channel than a vessel at anchor in the same place. This is not true, but it is, nevertheless, no argument in favor of the bridge. Vessels are sometimes absolutely obliged to come to an anchor in Detroit river, and this is another reason why any obstruction which can possibly be avoided should be avoided. A master will not bring his vessel to anchor in the river in the vicinity of Detroit except when absolutely obliged to do so, and then makes his stay there as short as possible. But there is no truth in the statement that the vessel is as much of an obstruction to the channel as a pier, even while she is there, for, should a moving vessel collide with her, the slack of her cable would permit of her yielding to the shock in any direction, thus diminishing the danger of disastrous consequences. On the other hand, if a vessel should collide with a stone pier the chances are two to one that she would be sunk and then there would be two obstructions in the channel instead of one. Following this would come the wreckers' paraphernalia for raising the vessel and the channel would be still further blockaded. The pier would be there for all time and it will frequently happen, as the years roll by, that several vessels would be sunk while one was being raised. These are not fictions as any lake captain from personal observation of parallel cases can testify.

Three years ago a man was stationed in the clock tower of the Michigan Central depot in Detroit for several days to ascertain the average length of interval between passing vessels. Whatever the interval may have been at that time, it has nothing to do with conditions at present or conditions that will prevail five years hence. There is an increasing demand in the country for commodities of all kinds carried on the lakes, and particularly in the eastern states. Take, for instance, the stone of Lake Superior which is rapidly coming into general use for building and other purposes. The supply of this material of the very best quality in the Lake Superior country is simply inexhaustible. This trade is limited as yet, but I am firmly of the belief that there are men now sailing the lakes who will see as large a fleet of boats in the stone-carrying trade as are now carrying iron ore, and the development and increase of other lines will be such that a short time hence two boats will pass Detroit to the one that passes there at present. But even now if a comparison be made between the business of the roads which are seeking to obstruct Detroit river by a bridge and the mighty volume of commerce which is moving both up and down Detroit river in almost unbroken streams, and if we divide the right to this highway between these two interests in the proportion developed by this comparison, we will find no argument in favor of a bridge. There is no alternative for the boats. They must have the river. There is an alternative for the railways. With the evidence of a tunnel in successful operation under St. Clair river, and the improved machinery and appliances that have been brought into tunnel construction, it is most too much to ask the public to believe that there are insurmountable obstacles in the way of constructing a tunnel under Detroit river.

The interests of ten thousand miles of lake coast and the adjacent territory are vitally concerned in the opposition to the construction of the bridge, while the general public is interested in watching the contest as a particular case involving the well-known general principles of railroad companies which have exasperated the people of this country for three-fourths of a century or more. The railway magnates, whose common motto is "good for this day and train only," have by methods and influences best known to themselves, obtained possession of whole streets in our cities, defaced parks and terraces with their tracks, and obstructed the streams of the country by their bridges, to say nothing of

the grabs by which they have secured a large portion of the fairest parts of many of our states, and all this against the protest of a vast majority of the people. They have not forgotten their cunning, but it will be a deplorable mistake if they are allowed to obstruct Detroit river, one of the most important national and international highways of the world. The whole country should move as a unit in opposition to such a scheme.

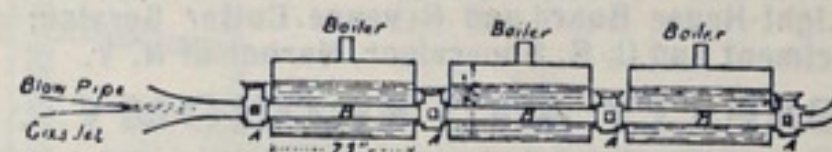
HARRY STONE.

Marine City, Mich., Feb. 4, 1896.

## Tests of the Serve Ribbed Tubes.

Charles W. Whitney of New York, sole agent in the United States for Serve's steel ribbed boiler and stay tubes, sends the REVIEW the following result of an experiment made with these tubes and plain tubes at Barrow, England, which was reported some time ago, in Engineering of London:

"Some interesting experiments on the relative efficiencies of Serve and plain boiler tubes have recently been made at Barrow by Mr. Blechynden. The apparatus used is shown diagrammatically in the annexed sketch. It consisted of a set of model boilers through which were placed a Serve tube and a plain tube marked B. The tubes of one boiler were coupled to those of the other as indicated, and Siemens'



pyrometers, A, A, A, A were fitted at the end of each tube. A blowpipe gas jet was then caused to send its flame through one set of the tubes. The pyrometer temperatures were noted, and also the evaporation effected. The boilers were 21 inches long by 7½ inches in diameter, and were clothed with asbestos and cotton wool. The Serve tubes were 2½ inches in diameter outside, and 2⅓ inches inside. They have seven ribs, ⅞ inches deep by ⅜ inches mean thickness. The plain tubes were of iron, and were made by Messrs. A. & J. Stewart & Clydesdale, Limited, of Glasgow. These were 2¾ inches in diameter outside, and 2 inches inside. The mean of several experiments showed that with a temperature of 1,000 Fah. at the blowpipe end of the boilers, and 500 Fah. at the uptake end, the Serve tube transmitted 6,000 British thermal units per square foot per hour, and the plain tube 4,500 British thermal units per square foot per hour. The area measurements were made on the outside or emission surface of the tubes. From these experiments it would seem that the Serve ribs are very efficient heat collectors, when hot gases are passed through the tubes."

## Trade Notes.

F. T. Holt, representing L. Katzenstein & Co's. metallic packing, called on Cleveland customers last week.

One of the best foundries in the southern states has just been built for the Newport News Foundry Co. at Hampton Va., by the Berlin Iron Bridge Co., of East Berlin, Conn. It is 160 feet long and 40 feet wide, the central portion being controlled by a traveling crane.

The Cleveland corporation heretofore known as the Condit-Fuller Co., will hereafter be known as the Bourne-Fuller Co. and in all respects except name, its business will be conducted as heretofore. This concern is best known on the lakes as sales agents for the Carbon Steel Co. and Cambria Iron Co. of Pittsburg and Johnstown, manufacturers of high grade plate, angles, channels, beams and other material for ship construction. Mr. B. F. Bourne, whose name now appears in the name of the corporation, has been the moving spirit in its affairs for some time past.

## Stocks of Grain at Lake Ports.

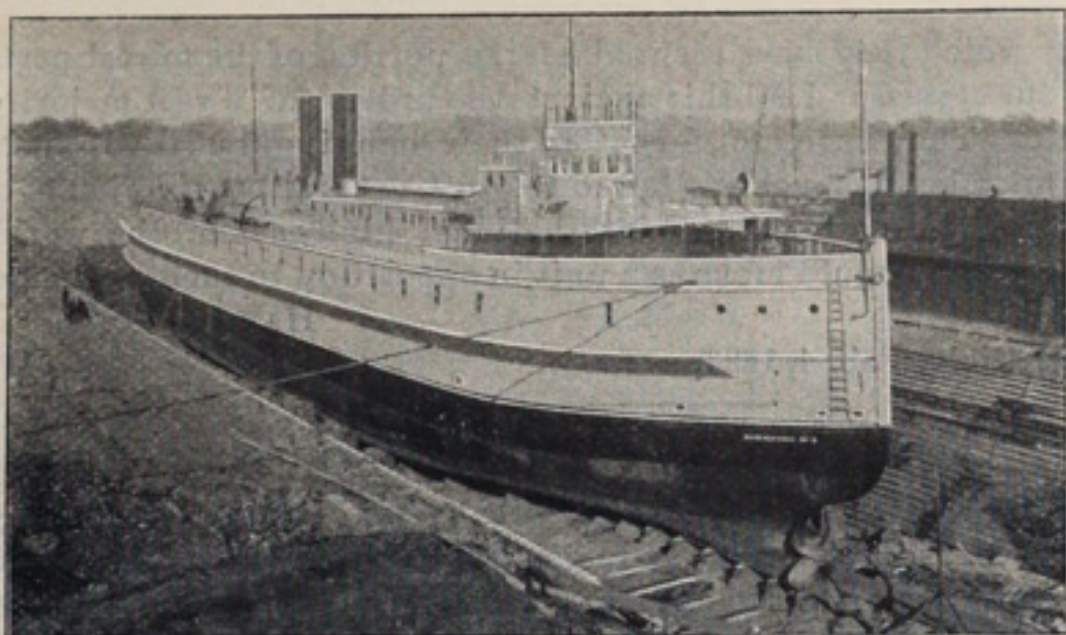
The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Feb. 1, 1896:

	Wheat, bushels.	Corn, bushels.
Chicago.....	20,965,000	3,753,000
Duluth.....	9,381,000	62,000
Milwaukee.....	412,000	2,000
Detroit.....	315,000	27,000
Toledo.....	796,000	530,000
Buffalo.....	2,575,000	108,000
Total.....	34,444,000	4,482,000

As compared with a week ago, the above figures show at the several points named a decrease of 14,000 bushels of wheat and an increase of 250,000 bushels of corn.

On Feb. 1, there was afloat at Chicago 38,000 bushels of wheat, 2,453,000 bushels of corn and 227,000 bushels of oats; at Buffalo, 259,000 bushels of wheat, 223,000 bushels of oats and 250,000 bushels of barley; at Duluth, 512,000 bushels of wheat; and at Milwaukee 176,000 bushels of wheat and 120,000 bushels of oats.





Shenango No. 2, 300 feet long, 5' feet beam.

# CRAIG SHIP BUILDING CO.

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## Metal and Wooden Ship Builders.

New Dry Dock—450 feet long, 110 feet wide on top,  
55 feet wide on bottom, 16 feet of Water on Sill.

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A Specialty.

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Have built 800 BOILERS TO DATE for...

Launches, Yachts, Passenger and Freight Steamers, Dredges, Tugs, Stern-Wheelers, Canalers; also for Navy Department, War Department, Treasury Department, Light-House Board and Revenue Cutter Service; also for N. Y. Dock Department and U. S. Supervisor, Harbor of N. Y.

### ...SAFETY AND ECONOMY...

Never killed a man or had a serious accident. \$250,000 capital. Works covering 29,000 square feet of ground. Never had a boiler returned on account of dissatisfaction. Every Boiler Warranted. All material made specially for our use. All boilers tested at 500 pounds hydrostatic pressure and 250 pounds of steam before shipping. Workmanship strictly first-class. All joints screwed and reliable. No expanded joints. State your requirements and we will furnish specifications. Correspondence solicited.

THE ROBERTS SAFETY WATER TUBE BOILER CO.,

39 and 41 Cortlandt Street, New York City.

Works, Red Bank, N. J.



### NAUTICAL WATCH CHAIN.

Solid Gold. Ship-shape in every detail.  
Send for Descriptive Circular.

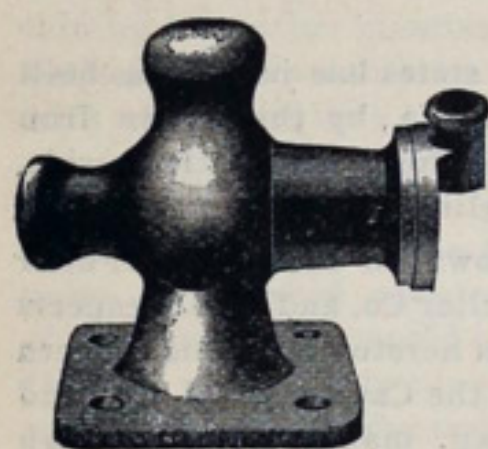
MORGAN A. ROBERTSON,

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## Enos Combined Bitt, Winch and Sheet Holder.

Patented U. S. A., England and Canada.



Takes the place of wooden or iron bitts and forms a Combination Bitt and Winch. Takes up less room than the ordinary bitt. Can be used to great advantage as a Windlass or Sheet Holder on Yachts. An examination will convince you of the many uses to which it can be put.

### FOR SALE BY

H. Channon Company, Chicago, Ill.  
Upson, Walton & Co., Cleveland, Ohio.  
Howard H. Baker & Co., Buffalo, N. Y.  
M. I. Wilcox Cordage & Supply Co., Toledo, O.  
H. D. Edwards & Co., Detroit, Mich.  
Henry Beckman & Son, Erie, Pa.  
And by Ship Chandlers in every seaport city lake port and town.

THE ENOS SHEET HOLDER CO.  
Manufacturers and Proprietors, PEABODY, MASS

## For Sale... PASSENGER PROPELLOR

Suitable for Excursion or Short Route.

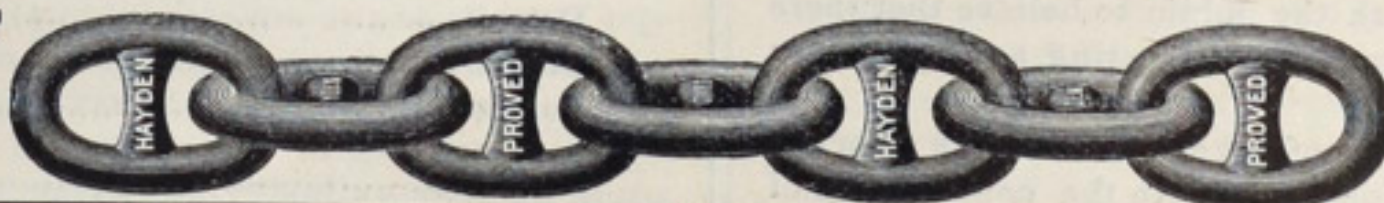
Rebuilt in 1893, 126 feet keel, 25 feet beam, 9 feet 6 inches depth of hold, capacity 400 excursionists, speed normal 11 to 12½ miles.

HART'S STEAMBOAT LINE, Green Bay, Wis.

## Chain Department \* P. HAYDEN S. H. CO. \* Columbus, Ohio.

Our Chain in use on the Largest Steamers on the Lakes:

The Zenith City, Victory,  
North West and North Land,  
and many others.



All kinds of Chain—  
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Write for Prices.

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350 STYLES AND SIZES.  
OVER 5000 IN USE.

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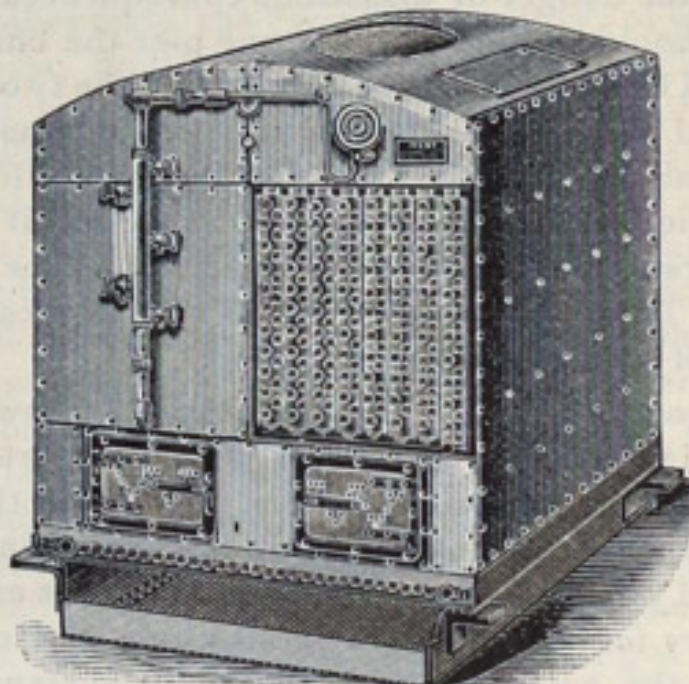
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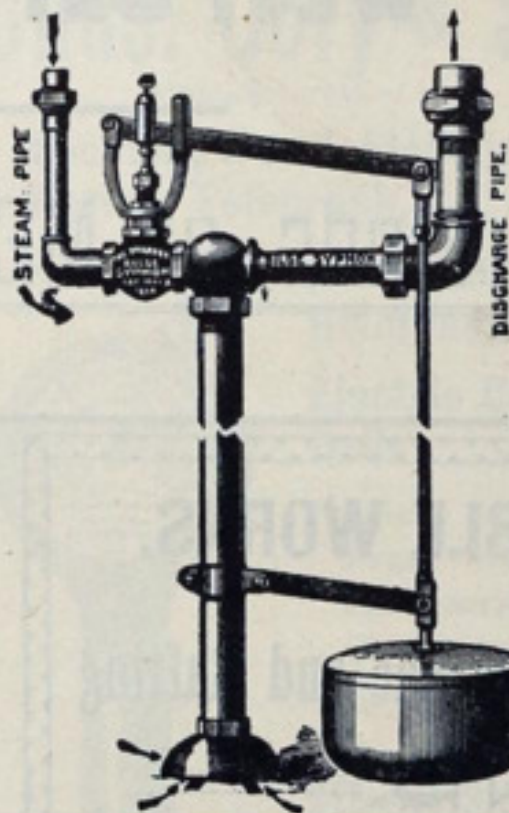


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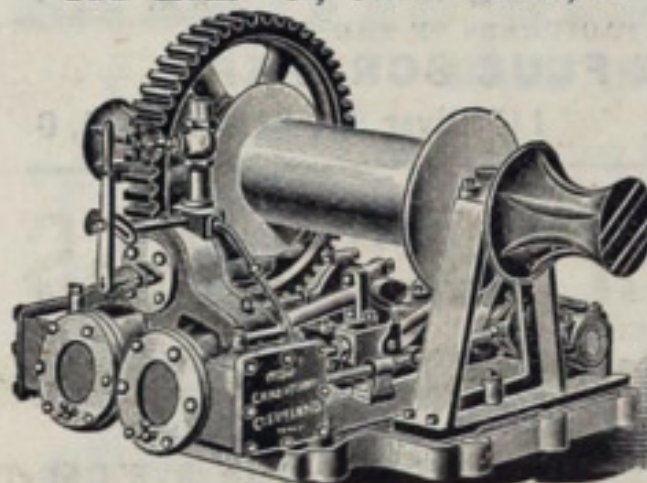
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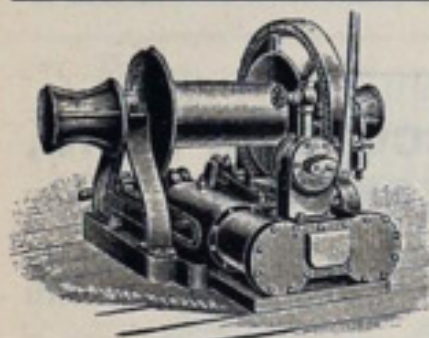
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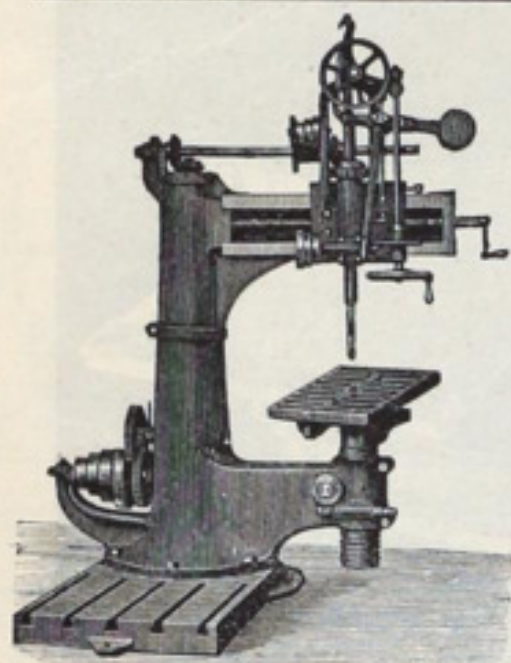
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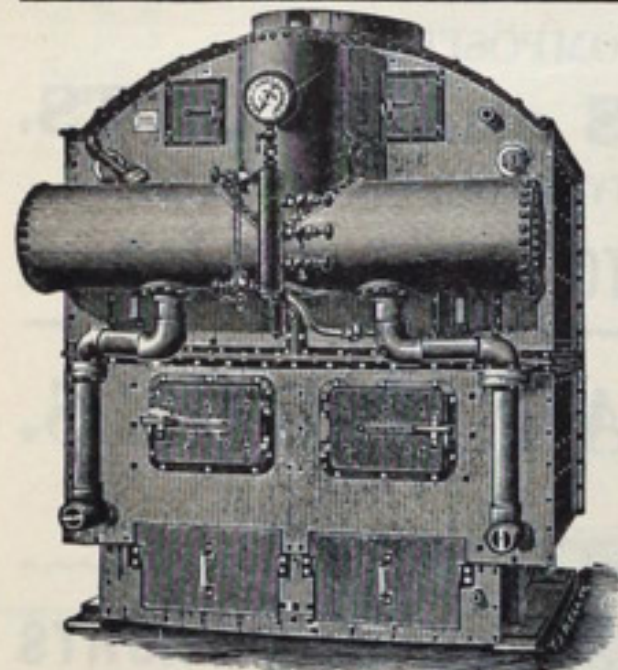
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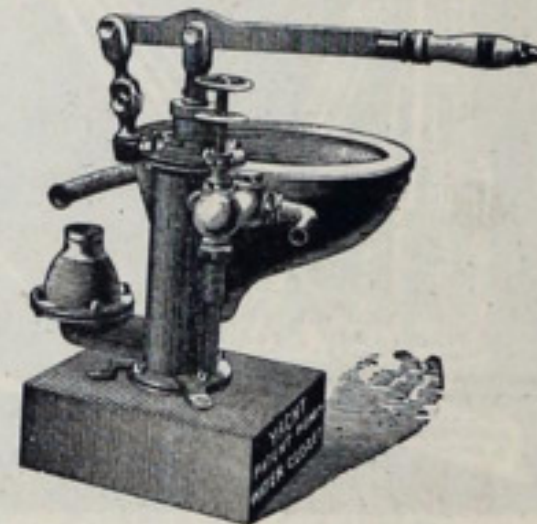


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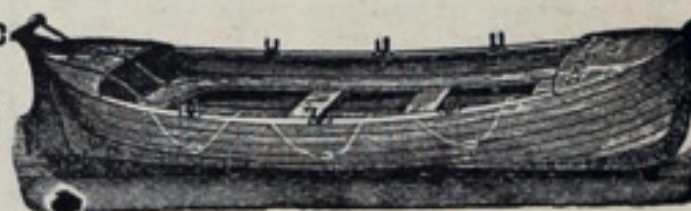
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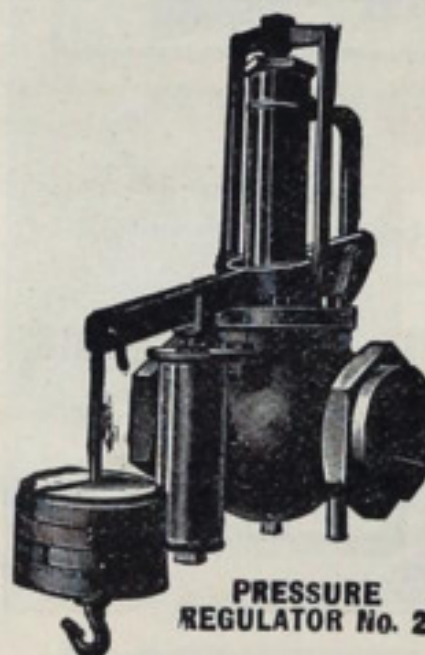
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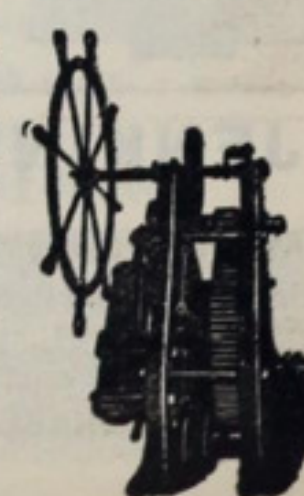
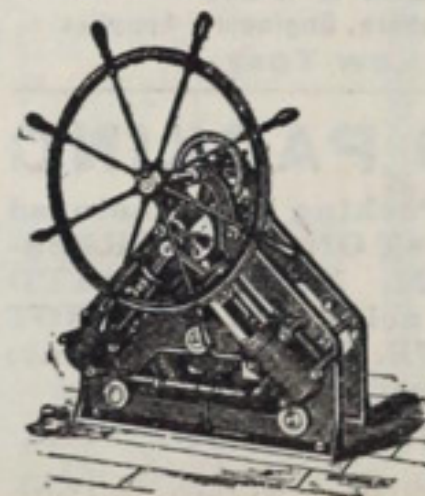
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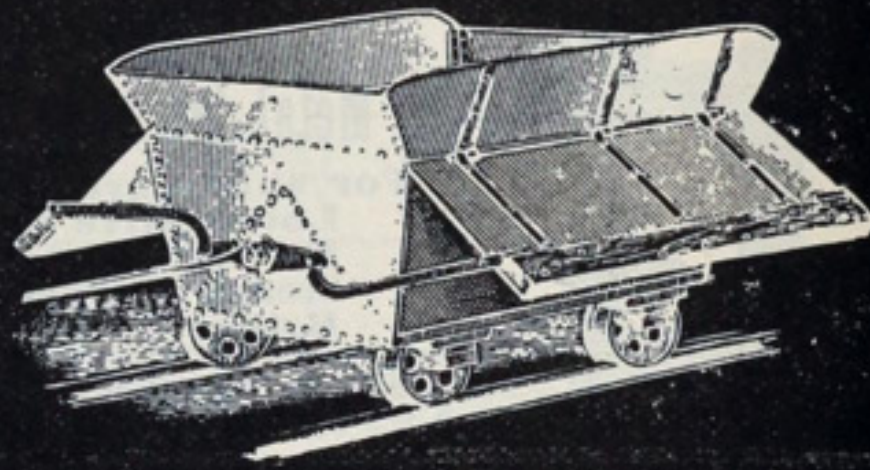
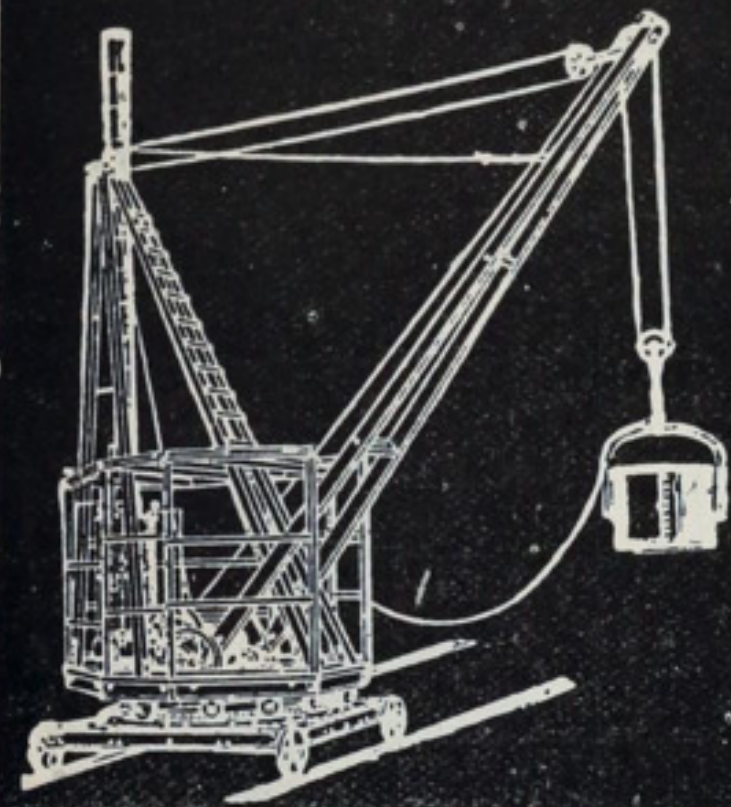
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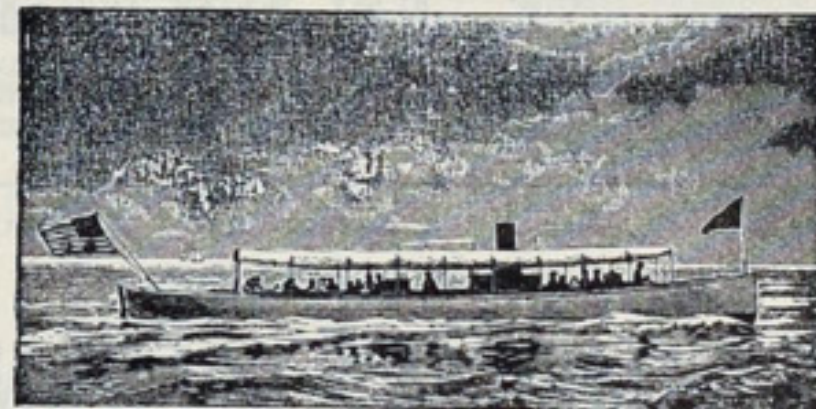
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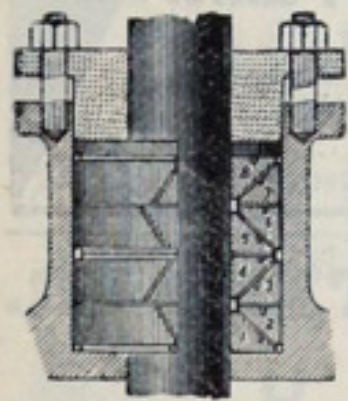
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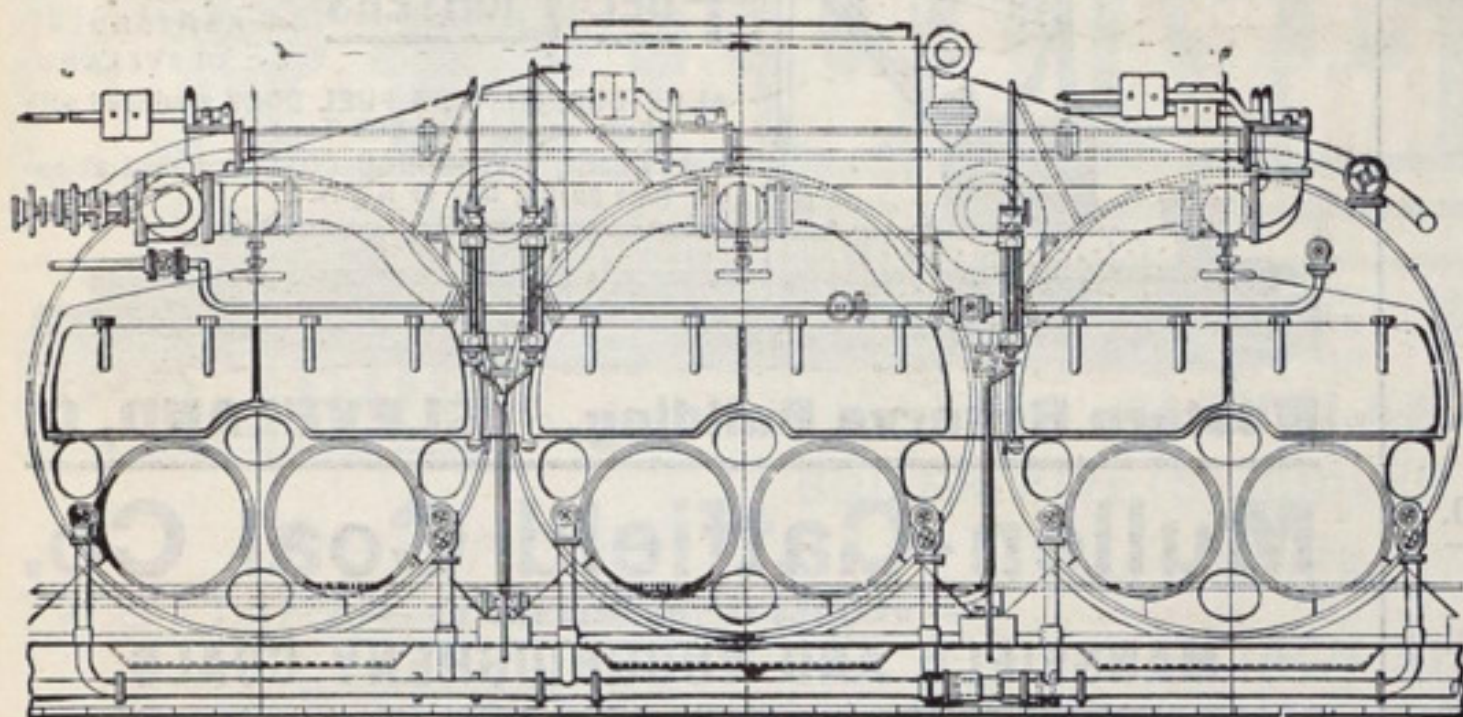
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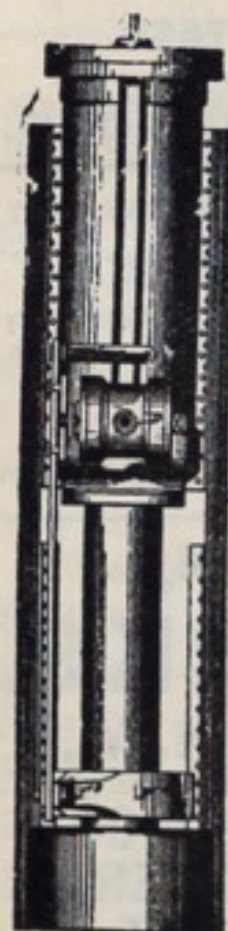


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		On blocks.	Over all.	Gate.	Top.		
Buffalo, N. Y.	Union Dry Dock Co.	Feet. 340	Feet. 348	Feet. 58½	Feet. 14	Feet. 9	To be 400 feet on blocks and 17 feet over sill. Timber.
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Chicago, Ill.	Chicago Ship Building Co. (Calumet)	445	470	70	17	18	Timber.
Cleveland, Ohio	Ship Owners Dry Dock Co.	450	465	50	14	17	
Cleveland, Ohio	do	325	340	55	20	14	Timber.
Cleveland, Ohio	Cleveland Dry Dock Co.	340	360	50	88	20	
Detroit, Mich.	Detroit Dry Dock Co.	365	378	79	90	16	Timber.
Detroit, Mich.	do	245	245	48	48	8½	
Port Huron, Mich.	Dunford & Alverson Dry Dock Co.	392	412	62	95	18	Graving.
Port Huron, Mich.	do	255	270	50	6	6	
Toledo, Ohio	Craig Ship Building Co.	200	250	45	8	8	Marine Railway (1,500 tons) also. To be ready June 1.
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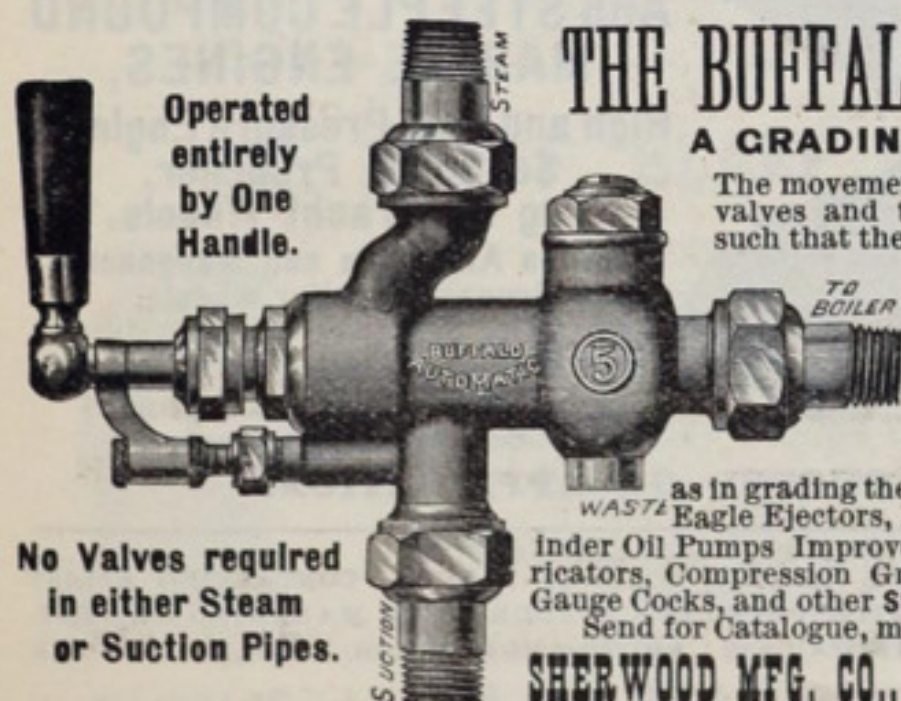
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Which is very effective, in that it is forced by steam in the down stroke, (which is not the case in other pile drivers), making the ram strike a quick and powerful blow. One advantage of this Hammer over others is, that the steam hose is inside the leaders, and not in the way of hoisting the piles as is the case in other steam hammers.

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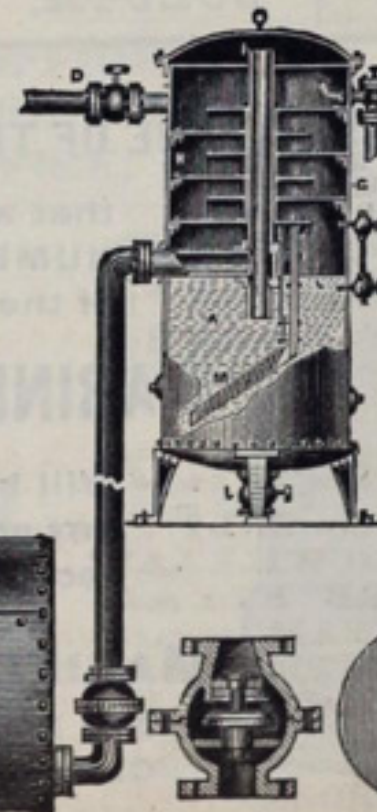
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- B.—Boiler.
- C.—Feed pipe to boiler.
- D.—Steam pipe.
- E.—Water supply pipe.
- F.—Check valve.
- G.—Spray disks.
- H.—Spray chamber.
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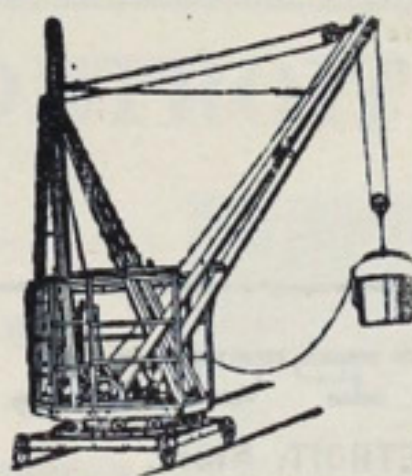
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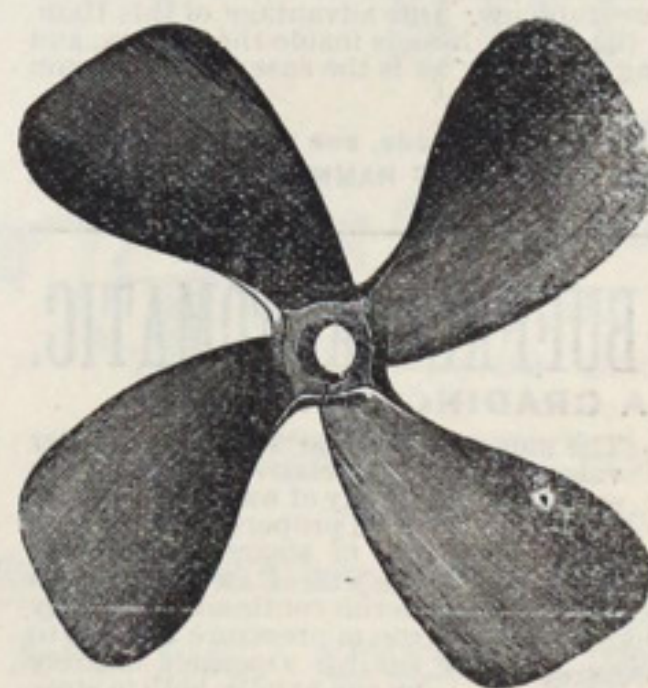


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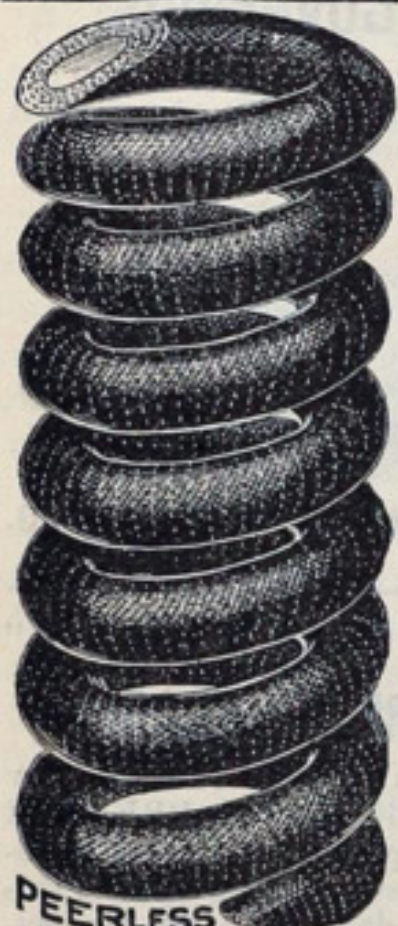
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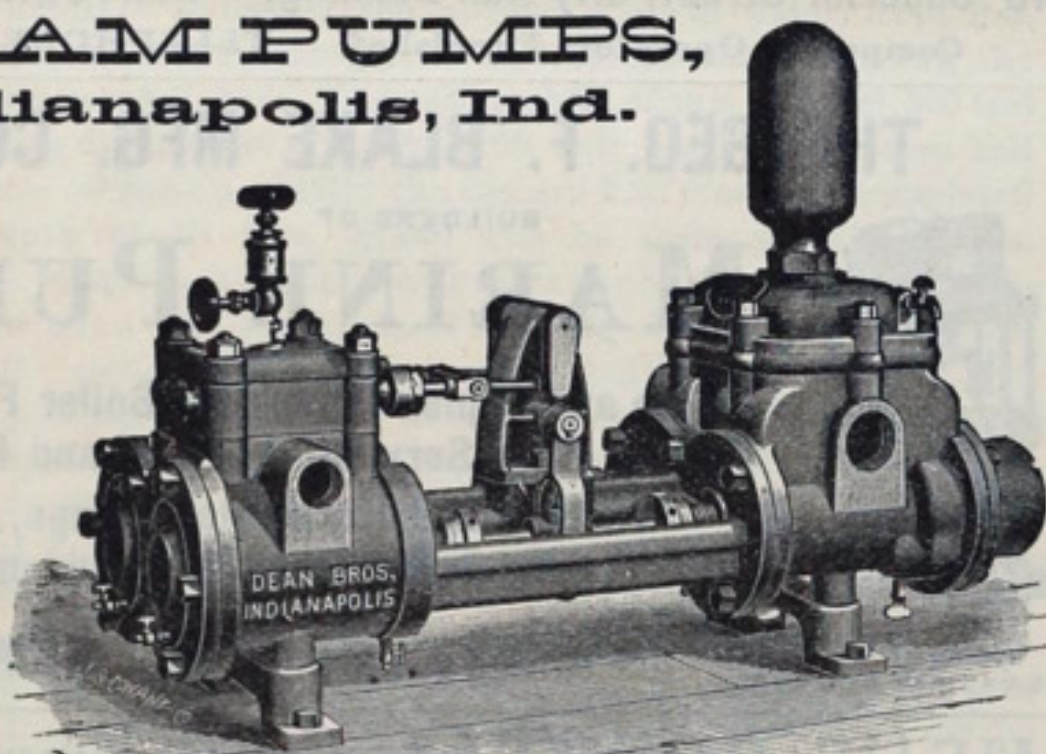
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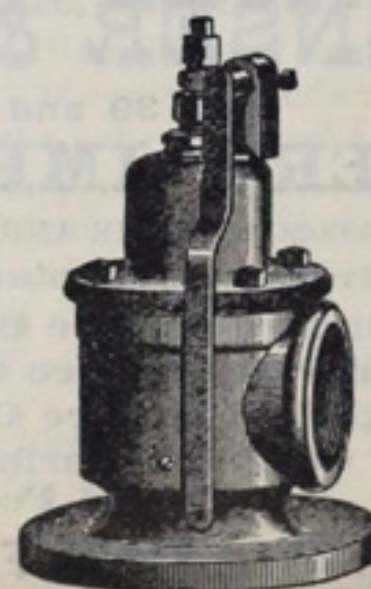
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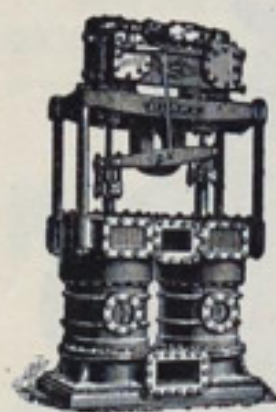
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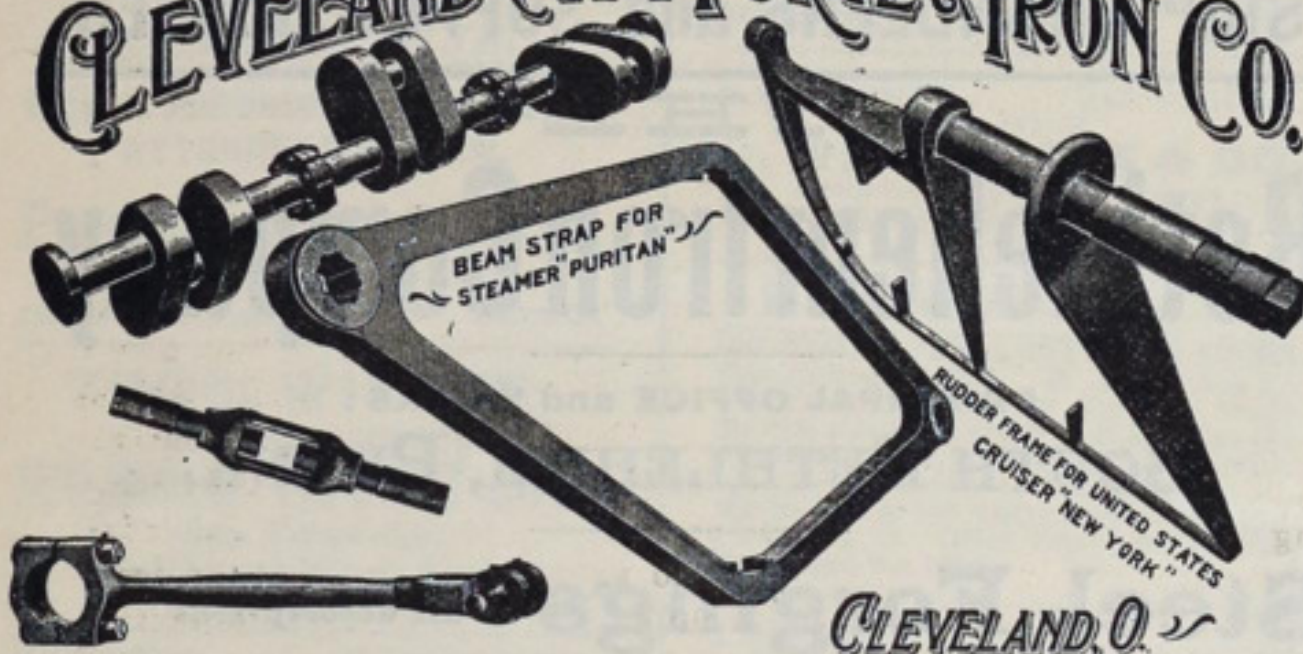
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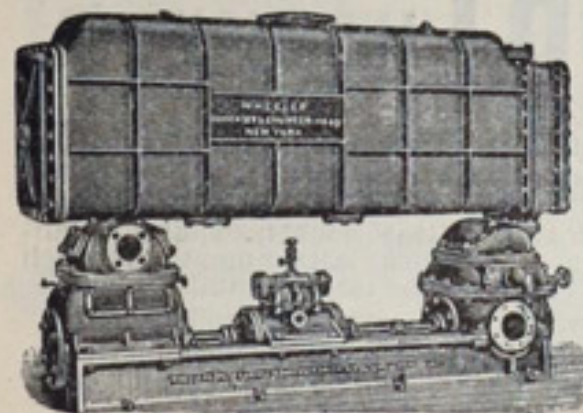
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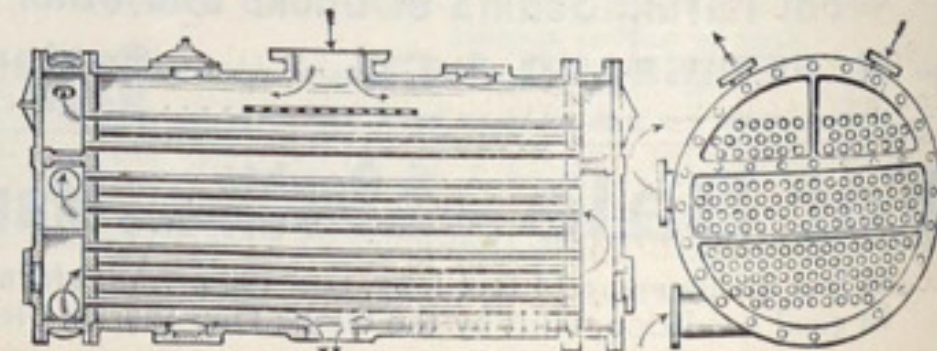
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